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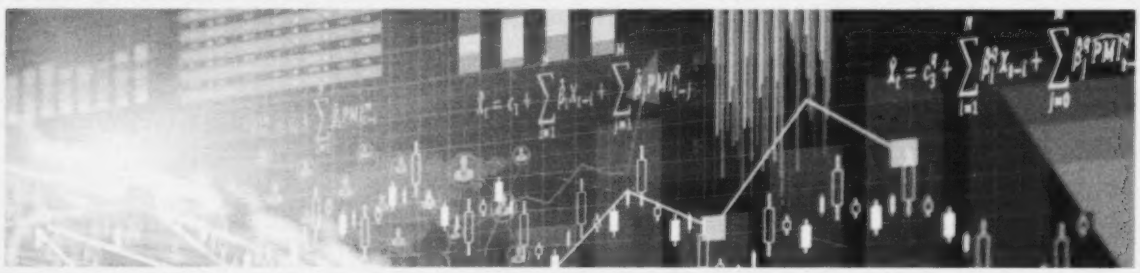
International Banking and Cross-Border Effects of Regulation: Lessons from Canada



by H. Evren Damar and Adi Mordel

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International Banking and Cross-Border Effects of Regulation: Lessons from Canada

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Abstract

We study how changes in prudential requirements affect cross-border lending of Canadian banks by utilizing an index that aggregates adjustments in key regulatory instruments across jurisdictions. We show that when a destination country tightens local prudential measures, Canadian banks lend more to that jurisdiction, and the effect is particularly significant when capital requirements are tightened and weaker if banks lend mainly via affiliates. Our evidence also suggests that Canadian banks adjust foreign lending in response to domestic regulatory changes. The results confirm the presence of heterogeneous spillover effects of foreign prudential requirements.

Bank topics: Financial system regulation and policies; Financial institutions; Financial stability
JEL codes: G01, F34, G21

Résumé

Nous étudions l'effet de modifications de la rigueur des exigences prudentielles sur les activités de prêts transfrontières des banques canadiennes au moyen d'un indice qui regroupe les variations des principaux instruments réglementaires employés dans divers pays. Nous montrons que les prêts des banques canadiennes augmentent quand le pays destinataire durcit ses mesures prudentielles, phénomène qui s'observe surtout lorsqu'il s'agit d'un relèvement des exigences de fonds propres, mais qui est moins marqué si les prêts sont accordés principalement par le biais d'entreprises liées. Nos résultats indiquent en outre que les variations des exigences réglementaires intérieures influent sur les activités de prêt à l'étranger des banques canadiennes. Enfin, nous confirmons la présence d'effets de débordement hétérogènes des exigences prudentielles dans les autres pays.

Sujets de la Banque : Réglementation et politiques relatives au système financier; Institutions financières; Stabilité financière
Codes JEL : G01, F34, G21

Non-Technical Summary

This paper studies how changes in prudential requirements affect foreign lending by Canadian banks. Providing evidence on the effectiveness of prudential tools in the context of cross-border banking activity is important, as various jurisdictions are implementing a wide range of prudential instruments to address post-crisis financial stability concerns. We take advantage of a distinctive data set that captures country-specific annual changes in general capital requirements, sector-specific capital requirements, interbank exposure limits, concentration limits, loan-to-value (LTV) ratio limits and reserve requirements in either local or foreign currency.

Our sample of Canadian banks is unique in addressing the above issues since the banks are relatively active abroad and tend to operate with capital buffers, a characteristic that could play a role in the banks' reaction. We focus on the outward transmission channel, which captures how Canadian banks' lending to a specific destination country reacts to policy changes at that destination. This can be either via the banks' foreign affiliates or via the Canadian headquarters, when cross-border lending is considered. We also study an extension of the outward channel, one that captures how changes to Canadian regulatory requirements affect foreign lending.

We find that, when a destination country tightens requirements, Canadian banks react by lending more to that jurisdiction, and the effect is particularly strong for changes in capital requirements. We also show that the effect of prudential policies depends on a global bank's business model. While stricter LTV limits are associated with an increase in foreign lending, the growth of credit slows in destination countries where Canadian banks operate mainly via affiliates. Finally, our extended analysis shows that changes to home policies are also important as they push Canadian banks to lend abroad.

The interpretation of our results depends on the policy-maker's objective. If the regulatory policies' original intention was to shift lending away from risky entities, then increased lending by Canadian banks can be a beneficial outcome as long as Canadian banks had healthier balance sheets compared with their local competitors. However, if the original intention was to slow down the growth of credit (i.e., lean against the cycle), then the results potentially point to the need for closer international policy coordination.

1. Introduction

How do regulatory changes in prudential requirements affect cross-border banking activities? Does the effect depend on the regulatory instrument being adjusted or on bank characteristics? And does it depend on the country of origin or the type of lending with which the bank is engaged? Understanding the effectiveness of regulatory changes on global banks' activities is of particular importance as various jurisdictions, in an effort to address financial stability concerns, are currently implementing a wide range of prudential instruments.

To date, empirical evidence on the international spillover effects of prudential policy instruments is limited, especially when based on a broad range of countries. For example, Houston, Lin and Ma (2012) find that banks transfer funds to markets with fewer regulations, and a similar result for the post-crisis period is presented by Bremus and Fratzscher (2014). Evidence on the international reallocation of banking activity is also provided by Aiyar et al. (2014), whereas Aiyar, Calomiris and Wieladek (2014) show that, in the UK, capital requirements applying only to domestic banks resulted in stronger lending by foreign institutions.

The focus of this International Banking Research Network (IBRN) project is to provide comprehensive evidence on the effectiveness of prudential tools in the context of cross-border banking activity, while using a common methodological approach and a data set comparable across jurisdictions and time (Buch and Goldberg 2015).[1] As part of this initiative, we explore a unique database to investigate such issues, using a sample of globally active Canadian banks. The Prudential Instruments Database, a joint product of the International Monetary Fund (IMF) and the IBRN, includes rich information on the announcement and implementation of policy changes across 64 countries for seven key instruments: general capital requirements; sector-specific capital requirements; interbank exposure limits; concentration limits; loan-to-value ratio limits; and reserve requirements in either local or foreign currency (for additional details, see Cerutti et al. [2015]).

[1] A full list of the contributions to this IBRN project is provided after the "References" section.

We combine the survey on changes in prudential instruments with regulatory filings on foreign lending by Canadian banks in each IBRN country. While we cannot distinguish if lending is conducted via a branch or a subsidiary—which could signal the extent to which a global bank is exposed to foreign regulations[2]—we do observe the type of foreign lending (foreign affiliates vs. cross-border). This enables us to evaluate the importance of the business model that a bank follows in each country, and whether this affects lending when prudential requirements change abroad. Overall, Canadian banks serve as an interesting case study because they are relatively active abroad and, during our sample period, operated with capital buffers above the minimum Basel requirements, which could have played a role in their reaction to prudential policy changes in other countries.

The focus of the analysis is on the outward transmission channel that is the most relevant for Canadian banks. The outward channel captures how Canadian lending to a specific destination country reacts to policy changes at that destination. This can take two forms: lending via the Canadian banks' foreign affiliates, or lending via the Canadian banks' headquarters (cross-border lending). We also study an extension of the outward channel, one that captures how changes to Canadian regulatory requirements affect foreign lending. Figure 1 provides a graphical representation of these respective channels. After examining the outward channel in detail, we extend the analysis by investigating the inward transmission channel, or the effect of foreign regulatory changes on domestic lending (that is, in Canada). This exercise investigates the degree to which domestic activities of Canadian banks are exposed to foreign regulations.[3]

We find that, when a destination country tightens requirements, Canadian banks react by lending more to that jurisdiction, and this effect is strongest when capital, LTV, or reserve requirements change. The economic magnitudes of tighter capital requirements can be significant: the average amount of new lending associated with a tightening is around Can$600 million (or approximately 10 per cent of the average foreign lending in a given quarter). However, since

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[2] Recall that, as a general principle, subsidiaries are subject to host-country supervision while branches are subject to home-country supervision.

[3] A different inward channel that could potentially exist is through foreign affiliates operating in Canada. However, the economic magnitude of this channel is likely to be limited since foreign affiliates have traditionally accounted for a very small share of domestic lending. Over the sample period, the average annual share of domestic lending by foreign subsidiaries and branches is only about 4.5 and 1.5 per cent, respectively. As such, the inward analysis focuses only on the home global banks.

such changes occur infrequently during the sample period, their overall impact is modest.[4] We note that such an outcome is not necessarily undesirable if the Canadian banks that increase lending have more capital compared with their local competitors. Under this scenario, lending would have shifted towards better-capitalized institutions and increased overall resilience of the banking sector (which may have been the policy's intention in the first place). Although our data do not allow us to compare Canadian banks' capital ratios with those of their competitors in each destination country, two pieces of information may be indicative of this outcome. First, we note that, for most of our sample period, Canadian banks operated with capital requirements that exceeded Basel minimum requirements, so it is possible that their capital ratios exceeded those of their competitors, at least in some foreign jurisdictions. Second, we find that some bank characteristics, such as Tier 1 capital, interact positively with the impact of regulatory changes in Canadian banks' foreign lending. Other important bank factors that support foreign lending are the size of the bank's international activities and its internal capital market, indicating that a developed intragroup market or presence across multiple jurisdictions is a key determinant of a bank's ability to redirect lending as prudential standards change at the destination.

Next, we study how regulatory adjustments interact with global banks' business models. If, in a certain destination, a Canadian bank lends mainly via an affiliate, then the bank's ability to adjust lending—perhaps by substituting cross-border loans—might be more limited. We show that, under tighter LTV limits, destination lending decreases if done mainly via affiliates. A similar slowdown in affiliate lending is observed for non-bank private loans when capital requirements are tightened.

As an extension to the outward transmission analysis, we also investigate how changes to domestic (i.e., Canadian) regulatory requirements affect foreign lending. We show that, in general, tighter home requirements push Canadian banks to lend abroad, but the effect differs across banks. For example, when domestic capital standards are tightened, we observe a reduction in foreign lending for banks that are more retail-oriented (i.e., with higher levels of illiquid assets) and/or for banks that are more internationally active, but an increase in lending

[4] For the Prudential Index, the magnitude is about Can$190 million of extra lending per tightening episode. When aggregated over 13 years across all banks and actions, this translates into an increase in lending of about Can$40 billion.

for banks that rely on core deposits. Finally, we complement the analysis by investigating the consequences of foreign regulatory changes on domestic Canadian lending, i.e., the inward transmission channel. We find that the tightening of foreign prudential policies is associated with a slowdown in the growth rate of domestic credit by global Canadian banks. Assuming a global bank has a fixed pool of funds, this finding is expected, given the positive effects for the outward channel. It indicates that global banks optimize lending across jurisdictions (reducing lending in one, increasing in another).

2. Data and Stylized Facts for Canada

2.1 Bank-level data

Our data are obtained from regulatory returns filed by all federally chartered financial institutions in Canada.[5] Bank-time-level data are globally consolidated at the parent level and are obtained from two forms: the quarterly "Basel Capital Adequacy Return" (for Tier 1 capital ratio) and the monthly "Balance Sheet" return (for all other bank-level data).

To construct the foreign lending of globally active Canadian banks, we use data from two sources. The form "Geographic Assets and Liabilities Booked in Canada" contains information on the cross-border activities (claims and liabilities) at the bank-country-time level, while the "Geographic Assets and Liabilities Booked Outside of Canada" provides claims and liabilities booked by foreign affiliates of Canadian banks. For the purposes of this study, we combine information from the two forms to create an aggregate "foreign lending" variable, without differentiating between cross-border loans and lending done through affiliates. As part of the robustness tests, we extend the analysis by treating these two lending types separately (see Section 3.2).

We perform a number of adjustments to the data. Given our primary focus on the outward transmission of regulatory policy changes, we first exclude all foreign banks and foreign bank branches from our sample. In addition, we exclude all domestic banks with assets less than

[5] Please see Chen et al. (2012) and Chapman and Damar (2015) for more details on our data sources. The actual forms and their filing instructions can be found at www.osfi-bsif.gc.ca/Eng/fi-if/rtn-rlv/fr-rf/dti-id/Pages/default.aspx.

Can$1 billion (in 2013Q4 dollars) at any point during our sample period. To eliminate the possibility that the results are driven by banks with limited foreign lending activity, we drop any observations where the outstanding foreign lending by bank i in country j in time t is less than Can$100 million. We then limit our sample to series of bank-country-time observations with at least eight consecutive non-missing quarterly observations. This yields a final estimation sample of 2,885 observations.

There are six domestically owned Canadian banks in our sample, the "Big Six" banks that have traditionally dominated the federally charted banking sector.[6] These six banks lend in 35 different foreign countries.[7] However, looking across individual banks, there is substantial variation in the scope of foreign lending. The number of countries to which banks lend varies between 3 and 29 (with an average of 16.8). Furthermore, there are only three countries where all six banks have substantial lending activities (China, the UK and the US). Meanwhile, our sample includes nine countries in which only one Canadian bank is active throughout the entire sample period (Belgium, Denmark, Finland, Greece, Malaysia, New Zealand, Peru, Slovak Republic and Thailand).[8]

For the baseline empirical analysis, our dependent variable is defined as

$\Delta Y_{b,j,t}$ = change in log loans by bank b to counterparties in country j at time t.

We also use a narrower definition of lending as an extension of the baseline specification:

$\Delta P_{b,j,t}$ = change in log private non-bank lending by bank b in country j at time t.

This allows us to investigate if some regulatory policies affect certain types of lending but not others. Ideally, we would like a finer subcategorization of loans (mortgages vs. unsecured

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6 These banks are the Bank of Montreal, Bank of Nova Scotia, Canadian Imperial Bank of Commerce, National Bank of Canada, Royal Bank of Canada and the Toronto Dominion Bank group. Among the federally chartered commercial banks (domestic and foreign subsidiaries), trust and loan companies, and foreign bank branches, these six banks hold approximately 90 per cent of all assets. There are also a number of provincially chartered credit unions and cooperative credit institutions in Canada. However, we exclude such institutions from this study as they do not file uniformly designed regulatory returns and have almost no foreign activities.

7 These are countries for which prudential policy, business cycle and financial cycle data are available. There are a few other countries (mainly in the Caribbean and South America) that would have otherwise met our sample inclusion criteria. Thus, the real number of countries with substantial lending by Canadian banks is around 40.

8 A full list of countries included in the sample, along with the number of Canadian banks active in each country, is provided in the Appendix (Table A3).

consumer lending vs. commercial loans, etc.). However, the regulatory forms only allow for the (relatively coarse) subcategorization of "loans to banks," "loans to non-bank public entities" and "loans to non-bank private entities." We use the last category in defining $\Delta P_{b,j,t}$.

Table 1 in the Appendix reports the different control variables. These are the log of total assets ($LogTotalAssets_{b,t-1}$), the percentage of a bank's portfolio of assets that is illiquid ($IlliquidAssetRatio_{b,t-1}$),[9] the percentage of the bank's balance sheet financed with core deposits ($CoreDeposits_{b,t-1}$)[10] and the bank's regulatory Tier 1 capital ratio ($Tier1Ratio_{b,t-1}$). We also include two variables related to the international aspects of Canadian banks' balance sheets. The first is the percentage of bank's foreign assets plus foreign liabilities relative to total assets plus total liabilities ($InternationalRatio_{b,t-1}$). The second variable measures the size of the bank's "internal capital markets," capturing the bank's net claims on its foreign affiliates. Specifically, we include the percentage of the bank's net due to head office minus net due from head office relative total liabilities ($NetIntragroupFunding_{b,t-1}$).

Since we would like to capture the exposure of globally active Canadian banks to changes in prudential measures, we construct two "prudential policy change" instruments according to their geographical specifications. Our first measure is "destination-country regulation" ($DestP_{j,t}$), which captures tightening or loosening of prudential measures in destination (or "host") country j and time t. This variable takes one of three possible values: +1 for a tightening, –1 for a loosening and 0 for no change. In most of the empirical specifications, we use the contemporaneous value of this variable along with its first two lags ($DestP_{j,t-l}$, where $l = 0, 1, 2$). For the second measure, we use "home-country regulation" ($Home_t$) in certain extensions of our empirical analysis. This allows us to investigate whether prudential policy changes in Canada affect Canadian banks' foreign lending. This variable is defined in a manner similar to $DestP_{j,t}$.

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[9] We limit illiquid assets only to loans due to data availability. Ideally, we would like to include other assets, such as held-to-maturity structured financial products, in our definition of illiquid assets. However, Canadian regulatory returns do not feature such a breakdown of banks' securities holdings during our sample period.

[10] Core deposits are defined as demand, notice and time deposits owned by individuals.

2.2 Stylized facts

Summary statistics on the banks' characteristics are presented in Table 1. While the banks are fairly similar in terms of size (given the small standard deviation for that variable), they exhibit greater diversity with regards to the level of capital, the share of international activity, the reliance on parent funding (i.e., net intragroup funding) and on core deposits. Summary statistics on the outward transmission of destination-country policy changes ($DestP_{j,t}$) are reported in Table 2. For the prudential index, there are a total of 223 changes reported by countries in which Canadian banks operate, and 73 per cent of those are associated with tightening of prudential requirements. Considering the individual components of the index, we observe that 8 per cent of the overall changes are to local reserve requirements, 4 per cent are to the LTV limits, 3.6 per cent are to foreign reserve requirements, and about 3 per cent are capital-related. Since interbank exposure limits and concentration ratios rarely change, we do not report regression results for these instruments.

There are a few characteristics unique to the Canadian system that make it ideal to study the consequences of foreign regulatory spillover effects. First, globally active Canadian banks are relatively more internationally oriented than their peers and, as such, are exposed to changes in foreign regulation. For example, the median *InternationalRatio* of Canadian banks is about 20 per cent, substantially larger than the one for US or French banks, at 5.2 and 7.7 per cent, respectively (see, respectively, Berrospide et al. [2016] and Bussière, Schmidt and Vinas [2016]). Furthermore, Canada has a history of federally regulated institutions operating with higher capital requirements. Between 1999 and 2013, the Office of the Superintendent of Financial Institutions (OSFI) required institutions to hold minimum Tier 1 and total capital ratios of 7 and 10 per cent, while the Basel II requirements were 4 and 8 per cent. Effectively, Canadian banks maintained a time-invariant capital buffer of 3 per cent for Tier 1 capital and 2 per cent for total capital. Finally, in recent years, Canadian regulators have used LTV limits

extensively (see Table 2 in the Appendix).[11] During the sample period, domestic authorities also adjusted capital requirements.[12] Thus, we limit the $Home_t$ indicator to capture only these two policies.

3. Empirical Method and Regression Results

3.1 Baseline analysis of outward transmission of prudential policies

The analysis explores the effect of changes in regulation on banks' growth rate in outstanding foreign loans, following the approach described in Buch and Goldberg (2015). We begin with the following regression specification, which controls for the outward transmission of destination-country macroprudential policy,

$$\Delta Y_{b,j,t} = \alpha_0 + \left(\alpha_1 DestP_{j,t} + \alpha_2 DestP_{j,t-1} + \alpha_3 DestP_{j,t-2}\right) + \alpha_4 X_{b,t-1} + \alpha_5 Z_{j,t} + f_j + f_t + f_b + \varepsilon_{b,j,t}, \quad (1)$$

where $\Delta Y_{b,j,t}$ is the log change in destination country j lending by a global Canadian b at time t. $DestP_{j,t}$ captures that country's prudential policy changes. $X_{b,t-1}$ is a vector of bank balance-sheet control variables and $Z_{j,t}$ represents the financial and business cycle variables for country j (as defined by Drehmann, Borio and Tsatsaronis [2011] and the BIS [2014]). Finally, f_j, f_t, f_b respectively represent country, time and bank fixed effects.

We report results from this specification in Table 3. First, we note that Canadian bank lending at the destination country is procyclical, as evidenced by the positive and significant business cycle coefficient.[13] More importantly for our study, the positive and significant (at 5 per cent) coefficient on the Prudential Index suggests that, when a destination country tightens

[11] In Canada, federally and most provincially regulated lenders are required by law to purchase insurance for mortgages that exceed 80 per cent of the value of the residential property. Since the insurance is guaranteed by the government, it sets minimum qualifying standards for borrowers, and key among those is the LTV limit.

[12] Capital changes included the full adoption of Basel II in 2007Q4, the implementation of Basel II.5 in 2012Q1 and the Basel III implementation in 2013Q1.

[13] The impact of prudential policy changes can vary across the business and/or financial cycles (expansion vs. recession). Taking this possibility into consideration, we changed equation (1) to include interactions of the cycle variables $Z_{j,t}$ with the prudential policy indicator ($DestP_{j,t}$). The effects of prudential policy changes do not appear to vary across cycles; the only exception to this is local currency reserve requirements, where the impact of a policy tightening is stronger during business cycle expansions.

requirements, Canadian banks lend more in that jurisdiction. The coefficient of $DestIP_{jt}$ implies that, for the ave ge Canadian bank, a tightening of the prudential policy index is associated with roughly Can$215 million of new lending in that jurisdiction.[14]

Results from individual components of the Prudential Index show that the effect is strongest for changes in capital requirements. The average amount of new lending associated with a tightening in capital requirements is around Can$600 million. The healthy balance sheets of Canadian banks during our sample period, and especially after the crisis (Chapman and Damar 2015), may have better positioned them to increase lending under tighter requirements. Furthermore, until the implementation of Basel III towards the end of the sample period, Canadian banks were required to maintain capital ratios above the Basel minimum. According to Ratnovski and Huang (2009), such requirements lower Canadian banks' incentives for foreign expansion "except in cases where they can have a distinct competitive advantage." Tighter capital requirements in certain foreign jurisdictions may have provided such competitive advantages; while domestic banks were adjusting to the new capital requirements by curbing credit growth, Canadian banks (that already operate under relatively strict capital levels) could have more easily adjusted lending and increased market share.

Our findings also indicate that the lending growth rate in a destination country increases under tighter local reserve requirements (cumulative effect) and stricter LTV limits (second lag of the policy). Surprisingly, this suggests that LTV limits, a product-level regulation that often targets borrower demand, may also affect credit supply. There could be two possibilities for this positive outcome. Recall that our data do not distinguish lending by entity type. This might be important in cases where the limits apply to a specific group of institutions, which does not include the Canadian affiliates. That would allow them to maintain (or increase) lending. Alternatively, it is possible that Canadian banks increase other types of lending, i.e., those that are not targeted by the LTV limits. Cerutti, Classens and Laeven (2016) and Akinci and Olmsted-Rumsey (2015)

[14] Given that our dependent variable is log change in foreign lending (multiplied by 100), a coefficient of 3.755 implies that, on average, $(foreign\ lending\ at\ time\ t / foreign\ lending\ at\ time\ t\text{-}1) = e^{(3.755/100)}$, which equals 1.038 if the prudential index is tightened by one unit at time t. Using the average value of foreign lending in our sample (Can$5.7 billion), we are able obtain an average increase of Can$216 million ($5.7 billion * 0.038). Given that there were 204 net tightenings throughout our sample period (317 tightenings – 113 loosenings), a simple estimate of the cumulative effect is Can$44 billion.

provide some cross-country evidence of LTV limits having an impact on overall credit growth. Therefore, if a limit tightening is associated with a broader slowdown, then foreign banks can take advantage of this and increase their lending more broadly.[15]

3.2 Outward transmission and bank characteristics

Our next specification explores more directly the role of bank characteristics by interacting them with $DestP_{j,t}$ such that

$$\Delta Y_{b,j,t} = \alpha_0 + (\alpha_1 DestP_{j,t} + \alpha_2 DestP_{j,t-1} + \alpha_3 DestP_{j,t-2}) + \alpha_4 X_{b,t-1} + \alpha_5 Z_{j,t} + (\beta_1 DestP_{j,t} \cdot X_{b,t-1} + \beta_2 DestP_{j,t-1} \cdot X_{b,t-1} + \beta_3 DestP_{j,t-2} \cdot X_{b,t-1}) + f_j + f_t + f_b + \varepsilon_{b,j,t}. \quad (2)$$

All variable definitions are the same as in equation (1), but the balance-sheet characteristics are now interacted with the destination-country prudential policy changes and their lags. For this specification (reported in Table 4), we focus on the cumulative effect (i.e., over the three periods) of the prudential measure and its interactions ($(\alpha_1 + \alpha_2 + \alpha_3)$ and $(\beta_1 + \beta_2 + \beta_3)$).

Exploring the Prudential Index first, we show that better-capitalized Canadian banks increase lending under tighter conditions, given the positive interaction term with the Tier 1 ratio. The Prudential Index results also suggest that more internationally active banks increase lending under such conditions. According to Table 4, the effect of some prudential measures depends on their interaction with the banks' characteristics. For instance, sector-specific capital buffers (SSCBs) are effective at slowing down the growth rate of credit for banks that rely on core deposits. Since SSCBs tend to target retail-lending activity (such as mortgage credit, auto loans or credit cards), it is not surprising to observe that the retail-oriented banks (those that rely on deposits) are most affected.[16] The effect is opposite for banks that rely on intragroup funding, suggesting that head office funding attenuates the negative effect of SSCB on foreign credit extension. Table 4 also indicates a positive relation between LTV tightening and foreign lending,

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[15] We ran a baseline specification that includes all prudential measures (and their lags) simultaneously, while excluding the aggregated PruC measure. We also excluded interbank exposure limits and concentration ratios from this specification, since those lack sufficient variation in our sample. The results (not presented for brevity) are almost identical to our findings in Table 3, with positive and significant cumulative effects for capital requirements and local reserve requirements.

[16] One should interpret the SSCB findings cautiously since SSCB changes are infrequent over the sample period.

given the statistical significance of the cumulative policy effect. While the effect depends on bank characteristics (such as size, liquidity and foreign activity), it broadly confirms the baseline results.

4. Extensions

4.1 The effect of prudential requirements on foreign lending via affiliates

If a global Canadian bank follows a diverse business model, one that supports both cross-border and affiliate lending, then such a bank may be better positioned to manage regulatory changes in a given jurisdiction compared with a bank that lends to that jurisdiction only via an affiliate. The reason is that the affiliate is more likely to be directly exposed to regulatory changes. Since our lending variable captures both cross-border lending (booked by the headquarters in Canada) and credit extension by foreign affiliates (of the Canadian banks via branches or subsidiaries), we can investigate more precisely the benefits of this flexibility by considering the portion of lending conducted via affiliates.

We differentiate between the two types of lending by considering the relative importance of affiliate lending for a given bank in a particular country.[17] Specifically, we define a new indicator variable $Affiliate_{b,j,t}$, that equals 1 if more than 95 per cent of bank b's lending in country j at time t is done via an affiliate.[18] We then interact $Affiliate_{b,j,t}$ with policy changes in the destination country ($DestP_{j,t}$) where all variable definitions are the same as in equation (2). In addition, we experiment with using the change in "total lending" and "total non-bank private lending" as different dependent variables. The empirical specification is

$$\Delta Y_{b,j,t} = \alpha_0 + \left(\alpha_1 DestP_{j,t} + \alpha_2 DestP_{j,t-1} + \alpha_3 DestP_{j,t-2}\right) + \left(\alpha_4 DestP_{j,t} \cdot Affiliate_{b,j,t} + \alpha_5 DestP_{j,t-1} \cdot Affiliate_{b,j,t-1} + \alpha_6 DestP_{j,t-2} \cdot Affiliate_{b,j,t-2}\right) + \alpha_7 X_{b,t-1} + f_j + f_t + f_b + \varepsilon_{b,j,t}. \quad (3)$$

[17] This is especially an issue for cross-border lending since some Canadian banks engage only in affiliate lending in certain countries.

[18] We have also considered 90 and 100 per cent as a cut-off for *Affiliate*. Our results are robust to these changes.

Table 5 reports the results from this specification.[19] For brevity, we discuss only the cumulative effects related to $DestP_{j,t}$ and its interaction with $Affiliate_{b,j,t}$. From Panel A, we observe that a tightening of the overall prudential index, and especially of the LTV requirement, increases the growth of foreign lending but not if it is through the affiliate (since *DestP* is positive but the interaction of *DestP*Affiliate* is negative). The stand-alone positive effect of the policy could be driven by cross-border lending.[20] However, the LTV effect seems to disappear once the dependent variable is defined as the change in non-bank private lending (Panel B). This remains a surprise: if Canadian banks circumvent LTV rules in foreign jurisdictions, perhaps via cross-border lending, then one would expect this to show up more strongly for non-bank private loans (which includes mortgages, the types of loans most likely to be covered under LTV limits).[21]

Finally, we note that tighter capital requirements slow down the growth of non-bank private lending, if it is mainly extended by Canadian banks' foreign affiliates (Panel B). However, tighter local reserve requirements are less effective (positive and significant interaction term), suggesting that foreign retail and corporate credit do not necessarily depend on locally sourced deposits.

4.2 Analysis of individual bank characteristics

One observation from Table 3 and Table 4 is that individual bank characteristics do not play a role in Canadian banks' lending in foreign jurisdictions, unless the bank characteristics interact with changes in destination-country policies. This may be because these variables do not vary across different foreign jurisdictions; although certain bank characteristics play a role in the *overall* foreign lending of a bank, perhaps these variables are not as important at the bank-country level. However, another possibility is that many of these individual bank characteristics are collinear with each other and their simultaneous inclusion in the empirical analysis is the reason behind their lack of significance.

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[19] We do not interact the bank characteristics with $DestP_{j,t}$ or $Affiliate_{b,j,t}$ in order to keep the specification as simple as possible. However, our main conclusions regarding $DestP_{j,t}$ and its interactions with $Affiliate_{b,j,t}$ are robust to including such interactions in the analysis.

[20] The fact that cross-border lending is a relatively small component of Canadian banks' foreign lending (and the fact that some Canadian banks do not engage in cross-border lending to certain jurisdictions at all) makes it difficult to fully establish this conclusion.

[21] Measurement and/or sample size issues could also be a potential explanation for this observation.

We consider the possibility of such a multicollinearity effect by re-estimating our baseline analysis given in equation (1) but including each bank characteristic separately on its own. Table 6 shows the results of this exercise where $DestP_{j,t}$ is defined as the overall Prudential Index (the results are similar when the individual policy measures are used). As seen in Table 6, none of the bank characteristics are significant even when included on their own, with the possible exception of the "Net Intragroup Funding" variable. This mostly rules out the possibility that our empirical analysis overlooks the impact of individual bank characteristics by including too many such variables in the analysis at the same time.

Another possibility is that the structure of lags in the empirical specification is affecting our findings on individual bank characteristics. Specifically, the analysis includes the first and second lags of prudential policy indicators, but only the first lags of the bank characteristics. It could be that the second lag of the prudential policy variable impacts the first lag of the bank characteristics, especially if the prudential change occurs in a foreign jurisdiction that is an important market for the bank. We consider this possibility in Table 7, where we include the *third* lag of the individual bank characteristics. Similar to Table 6, the "Net Intragroup Funding" variable becomes significant with this specification; otherwise, our results are mainly unchanged.

4.3 Impact of home-country policy changes

It is possible that regulatory policy changes in Canada also influence Canadian banks' lending abroad. Therefore, we investigate how changes in the home-country prudential instruments (*HomeP*) affect destination-country lending. Since only capital requirements and LTV limits changed in Canada over our sample period, we conduct the analysis on these two instruments. The regression specification is

$$\Delta Y_{b,j,t} = \alpha_0 + \left(\alpha_1 DestP_{j,t} + \alpha_2 DestP_{j,t-1} + \alpha_3 DestP_{j,t-2}\right) + \alpha_4 X_{b,t-1} + \alpha_5 Z_{j,t} + \left(\beta_1 HomeP_{j,t} \cdot X_{b,t-1} + \beta_2 HomeP_{j,t-1} \cdot X_{b,t-1} + \beta_3 HomeP_{j,t-2 \cdot X_{b,t-1}}\right) + f_j + f_t + f_b + \varepsilon_{b,j,t}. \quad (4)$$

In equation (4), the main coefficients of interest are β_1, β_2 and β_3 (since *HomeP* is bank invariant at a given time period, it is captured by the time fixed effect). We focus on the cumulative coefficients ($\beta_1 + \beta_2 + \beta_3$) for ease of comparison. The results from Table 8 indicate that tighter prudential home requirements push certain types of banks to lend abroad, as observed via the interaction terms between the bank characteristics and *HomeP*. The effect comes from both higher Canadian capital requirements and LTV limits. However, the mechanism through which the requirements affect lending might differ.

Considering capital changes first, more internationally oriented and less-liquid banks decrease foreign lending when capital requirements in Canada are tightened. It could be that these banks engage in foreign lending activities with higher risk-weights and, under higher capital requirements, these banks shift away from such activities. However, more retail-deposit-funded Canadian banks increase foreign lending under tighter domestic capital requirements. This finding might be driven by that fact that the Canadian capital requirement changes in our sample (2012Q1 and 2013Q1) coincided with periods in which Canadian banks were engaged in foreign acquisitions. As discussed in Chapman and Damar (2015), since the 2008 crisis, Canadian banks have taken advantage of their relatively healthy balance sheets (and the official Canadian liquidity facilities) to engage in foreign acquisitions that boosted their foreign loan book. In other words, the link between capital requirement tightenings in Canada and foreign lending by Canadian banks might be a product of both the timing and contents of the policy change.

Regarding LTV requirements, Table 8 indicates that larger Canadian banks increase their foreign lending when LTV requirements are tightened at home. Specifically, the coefficient of *Log Total Assets * HomeP* implies that a tightening of Canadian LTV requirements *and* a bank moving from the median asset size to the 75th percentile will be associated with Can$780 million of total new foreign lending.[22] This increase is likely driven by a desire to compensate for slower mortgage credit growth at home. We note that the LTV limits in Canada apply at the borrower level, are only for domestic mortgage lending and, as such, are unrelated to the banks' activities

[22] The difference between the median and 75th percentile of *Log Total Assets* is 0.41 (20.16-19.75). Multiplying this by the coefficient of *Log Total Assets * HomeP* yields 12.823, implying (*foreign lending at time t/ foreign lending at time t-1*) = $e^{(12.823*.041)} = 1.136$. Using the average value of foreign lending then results in $780 million.

abroad. Therefore, the impact of home-country macroprudential policy actions on foreign lending is likely dependent on the nature of the policy tool used and the timing of the policy change with regards to global (or at least regional) conditions.

4.4 Inward transmission of foreign policies

Finally, we briefly investigate the transmission of foreign policy changes into Canada via globally active Canadian banks ("inward transmission"). As discussed above, there potentially could exist another inward channel, via foreign subsidiaries and bank branches that operate in Canada. However, the economic magnitudes of this channel are likely small. For instance, over the sample period, the average annual share of domestic lending by foreign subsidiaries and branches is about 4.5 and 1.5 per cent, respectively. Given the limited role played by these institutions in the Canadian financial system, we limit our inward transmission exercise to large, globally active Canadian banks. We estimate the following model:

$$\Delta Y_{b,t} = \alpha_0 + \left(\alpha_1 ExpP_{b,t} + \alpha_2 ExpP_{b,t-1} + \alpha_3 ExpP_{b,t-2}\right) + \alpha_4 X_{b,t-1} + (\beta_1 ExpP_{b,t} \cdot X_{b,t-1} + \beta_2 ExpP_{b,t-1} \cdot X_{b,t-1} + \beta_3 ExpP_{b,t-2} \cdot X_{b,t-1}) + f_t + f_b + \varepsilon_{b,j,t}, \quad (5)$$

where $Y_{b,t}$ is domestic (i.e., Canadian) lending of bank b at time t, and $ExpP_{b,t}$ is "foreign exposure weighted regulation" faced by bank b at time t. $ExpP_{b,t}$ is an average of all foreign regulation indices at time t, weighted by the total assets and liabilities of bank b in each country. We use the same bank characteristics as in previous specifications. All regressions include time and bank fixed effects.

We present the results in Table 9. According to the inward channel, tighter foreign capital and LTV requirements are associated with a slowdown in the growth rate of domestic lending by the six largest Canadian global banks (cumulative effect of each policy is negative). These results are in line with the outward analysis from the previous tables. This indicates that, as foreign regulatory requirements become stricter, Canadian banks increase the foreign lending growth rate to those destination countries and also reduce the growth of domestic credit.

5. Concluding Remarks

We study how regulatory changes in prudential requirements affect the cross-border activities of Canadian banks. Our results show that the effect depends on the regulatory instrument being adjusted, and that bank characteristics determine the extent to which the institutions can maintain or increase lending under stricter conditions.

We find that, when a destination country tightens requirements, Canadian banks react by lending more to that jurisdiction, and the effect is particularly strong for changes in capital requirements. We also show that the effect of prudential policies depends on a global bank's business model. While stricter LTV limits are associated with an increase in foreign lending, the growth of credit slows in destination countries where Canadian banks operate mainly via affiliates. We extend the analysis to show that home policies push Canadian banks to lend abroad and to confirm the existence of a limited inward transmission channel.

The spillovers identified in our study need not necessarily represent a negative outcome. If the regulatory policies' original intention was to shift lending away from risky entities, then increased lending by Canadian banks can be a beneficial outcome, as long as Canadian banks had healthier balance sheets compared with their local competitors. However, if there were no such differences between local and Canadian banks, or if the original intention of the policies was to slow down the growth of credit (i.e., lean against the cycle), then our results potentially point to the need for closer international policy coordination. Raising the awareness of individual jurisdictions about how their policy actions may affect the credit cycles of other countries may be warranted.

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Figure 1: Transmission channels of regulatory policy changes. Channels that are relevant for Canada are captured by the solid lines.

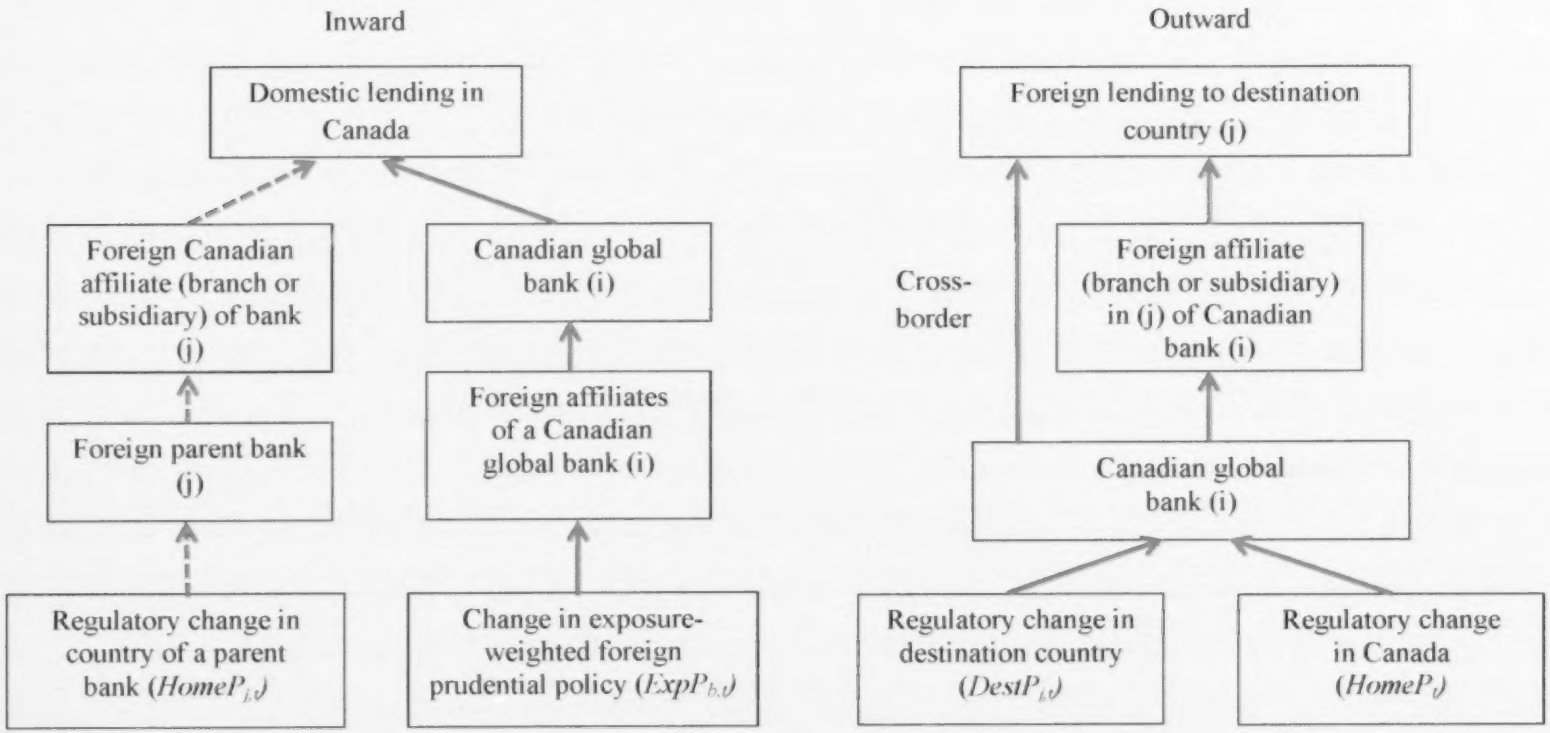
Inward
Domestic lending in Canada
Foreign Canadian affiliate (branch or subsidiary) of bank (j)
Canadian global bank (i)
Foreign parent bank (j)
Foreign affiliates of a Canadian global bank (i)
Regulatory change in country of a parent bank ($HomeP_{i,j}$)
Change in exposure-weighted foreign prudential policy ($ExpP_{b,j}$)
Outward
Foreign lending to destination country (j)
Cross-border
Foreign affiliate (branch or subsidiary) in (j) of Canadian bank (i)
Canadian global bank (i)
Regulatory change in destination country ($DestP_{i,j}$)
Regulatory change in Canada ($HomeP_j$)

Table 1: Summary statistics on foreign lending and bank characteristics

This table provides summary statistics for bank balance-sheet and lending data. Data are observed quarterly from 2000Q1–2013Q4. Banking data come from the globally consolidated balance-sheet and capital reporting forms and are reported at the parent level. Net intergroup funding measures from the perspective of a bank's head office total net internal lending (or borrowing) vis-à-vis all its related domestic and international offices. Given the globally consolidated nature of the independent variables, summary statistics are reported at the bank-quarter level. Meanwhile, the dependent variables are measured at the bank-country-time level and the summary statistics are reported accordingly.

		All banks (n = 6)		
Variable	Observations	Mean	Median	SD
Dependent variables				
Δ Foreign Loans	2885	0.086	0.099	25.75
Δ Foreign Private Non-Bank Loans	2589	-0.636	-0.267	26.968
Independent variables				
Log Total Assets	324	19.729	19.758	0.555
Tier1 Ratio (%)	324	9.793	9.224	2.159
Illiquid Assets Ratio (%)	324	54.47	54.86	5.537
International Activity	324	21.799	23.259	7.909
Net Intragroup Funding / Liabilities (%)	324	0.221	-0.025	1.125
Core Deposits Ratio (%)	324	26.886	25.661	5.041

Table 2: Summary statistics on changes in macroprudential instruments

This table focuses on the outward transmission of policy to destination country and presents summary statistics on changes in macroprudential instruments for Canadian banks over the period 2000–13. Data on the eight instruments come from the "Macroprudential Instruments Database" by Cerutti et al. (2015) and are quarterly. The number of changes in macroprudential instruments is reported on several dimensions, i.e., on the country-time level and on the bank-time level. The last column shows the share of prudential changes to total observations (i.e., the share of non-zero observations). The reported data are based on the regression sample.

	Policy changes in destination country				
Instrument	# of country-time changes	# of country-time changes (tightening)	# of country-time changes (loosening)	# of bank-country-time changes	Proportion base – MPP non-zero
Prudential Index	223	164	59	426	0.165
General capital requirements	39	39	0	86	0.029
Sector-specific capital buffer	33	26	7	53	0.024
Loan-to-value ratio limits	54	43	11	122	0.040
Reserve requirements: Foreign	48	31	17	75	0.036
Reserve requirements: Local	112	61	51	203	0.083
Interbank exposure limit	10	10	0	22	0.007
Concentration ratio	12	12	0	20	0.009

Table 3: Outward transmission of policy to destination country

This table reports the effects of changes in destination-country regulation and firm characteristics on log changes in total loans by destination country. The data are quarterly from 2000Q1 to 2013Q4 for a panel of bank holding companies and are globally consolidated at the parent level. DestP refers to the changes in regulation in the destination country of the loan. For more details on the variables, see Appendix Table A1. Each column gives the results for the regulatory measure specified in the column headline. All specifications include bank, country and time fixed effects. Standard errors (in parentheses) are clustered by country. ***, ** and * indicate significance at the 1, 5 and 10 per cent level, respectively.

	DestP = Prudential IndexC	DestP = Capital requirements	DestP = Sector-specific capital buffer	DestP = Loan-to-value ratio	DestP = Reserve requirement foreign	DestP = Reserve requirement local
Destination-country regulation DestP_t	3.755**	9.985**	-0.279	1.834	-1.065	2.517*
	(1.463)	(4.333)	(1.550)	(3.517)	(1.010)	(1.415)
Destination-country regulation DestP_t-1	1.233	5.194	0.183	-1.535	1.714	1.882
	(1.521)	(3.868)	(1.412)	(1.677)	(2.228)	(2.279)
Destination-country regulation DestP_t-2	1.089	2.488	2.415	3.395**	0.763	1.036
	(1.340)	(4.799)	(2.458)	(1.600)	(1.436)	(1.347)
Log Total Assets_t-1	-8.228	-9.698	-8.544	-8.048	-8.548	-8.748
	(5.845)	(5.850)	(5.734)	(6.051)	(5.797)	(5.831)
Tier1 Ratio_t-1	-0.600	-0.647	-0.589	-0.580	-0.593	-0.653
	(1.015)	(0.984)	(1.011)	(1.014)	(1.009)	(1.008)
Illiquid Assets Ratio_t-1	-0.135	-0.161	-0.162	-0.151	-0.150	-0.135
	(0.271)	(0.257)	(0.264)	(0.264)	(0.261)	(0.272)
International Activity_t-1	0.083	0.072	0.052	0.053	0.051	0.069
	(0.163)	(0.164)	(0.163)	(0.163)	(0.164)	(0.165)
Net Intragroup Funding_t-1	0.226	0.239	0.221	0.218	0.220	0.213
	(0.135)	(0.148)	(0.140)	(0.140)	(0.142)	(0.136)
Core Deposits Ratio_t-1	0.071	0.066	0.069	0.070	0.061	0.070
	(0.352)	(0.354)	(0.358)	(0.352)	(0.356)	(0.355)
Financial cycle (Destination country)	0.017	0.018	0.018	0.015	0.019	0.019
	(0.034)	(0.036)	(0.033)	(0.032)	(0.033)	(0.033)
Business cycle (Destination country)	0.551*	0.706**	0.710**	0.681**	0.705**	0.726**
	(0.324)	(0.315)	(0.321)	(0.328)	(0.333)	(0.322)
Cumulative Effect DestP	6.076**	17.667*	2.319	3.694	1.412	5.435**
	(2.601)	(9.702)	(2.828)	(4.044)	(2.407)	(2.603)
Observations	2885	2885	2885	2885	2885	2885
Adjusted R-squared	0.025	0.025	0.022	0.022	0.022	0.023
Number of destination countries	35	35	35	35	35	35
Number of banks	6	6	6	6	6	6

Table 4: Outward transmission of policy (bank character interactions)

This table reports the effects of changes in destination-country regulation and firm characteristics, business and financial cycles, and their interactions on log changes in total loans by destination country. The data are quarterly from 2000Q1 to 2013Q4 for a panel of bank holding companies and are globally consolidated at the parent level). DestP refers to the cumulative changes in regulation in the destination country of the loan. For more details on the variables, see Appendix Table 1. Each column gives the result for the regulatory measure specified in the column headline. All specifications include bank, country and time fixed effects. Standard errors (in parentheses) are clustered by country. ***, ** and * indicate significance at the 1, 5, and 10 per cent level, respectively.

	DestP – Prudential IndexC	DestP – Capital requirements	DestP – Sector-specific capital buffer	DestP – Loan-to-value ratio	DestP – Reserve requirement foreign	DestP – Reserve requirement local
Destination-country regulation DestP t	-135.632	-417.905	122.622	310.584***	-461.511**	-139.083*
	(108.377)	(278.540)	(171.578)	(96.801)	(216.681)	(81.663)
Destination-country regulation DestP t-1	77.496	529.251	-37.275	-24.686	169.189	-48.745
	(103.963)	(329.417)	(164.511)	(90.363)	(259.695)	(88.057)
Destination-country regulation DestP t-2	24.499	143.010	-359.363*	101.997	376.308**	176.612
	(89.743)	(266.809)	(204.726)	(130.919)	(142.100)	(116.807)
Log Total Assets_t-1	-9.145	-11.604*	-9.277	-6.570	-8.506	-9.735
	(6.107)	(6.213)	(5.910)	(6.163)	(5.999)	(5.874)
Tier1 Ratio_t-1	-0.735	-0.483	-0.515	-0.557	-0.640	-0.635
	(1.025)	(0.983)	(1.046)	(1.073)	(1.009)	(1.024)
Illiquid Assets Ratio_t-1	-0.129	-0.031	-0.139	-0.100	-0.138	-0.119
	(0.263)	(0.305)	(0.259)	(0.274)	(0.265)	(0.267)
International Activity_t-1	0.027	0.039	0.072	-0.027	0.059	0.075
	(0.175)	(0.181)	(0.162)	(0.173)	(0.169)	(0.168)
Net Intragroup Funding_t-1	0.242*	0.267*	0.218	0.216	0.229	0.219
	(0.138)	(0.149)	(0.136)	(0.143)	(0.140)	(0.130)
Core Deposits Ratio_t-1	0.064	-0.047	0.041	0.030	0.054	0.042
	(0.344)	(0.366)	(0.346)	(0.374)	(0.362)	(0.368)
Financial cycle (Destination country)	0.010	0.018	0.013	0.011	0.020	0.018
	(0.036)	(0.037)	(0.036)	(0.034)	(0.033)	(0.033)
Business cycle (Destination country)	0.541	0.709**	0.720**	0.678*	0.612*	0.542
	(0.338)	(0.310)	(0.314)	(0.335)	(0.360)	(0.322)
Log Total Assets * DestP	-0.842	0.232	20.243	-24.760***	-4.588	-3.385
	(5.699)	(30.395)	(15.314)	(7.278)	(6.578)	(7.054)
Tier1 Ratio * DestP	1.791**	-10.809	-0.762	1.164	2.852***	1.878**
	(0.838)	(6.452)	(2.205)	(1.203)	(0.833)	(0.817)
Illiquid Assets Ratio * DestP	0.403	-1.818	-1.214	1.247***	-0.355	0.851**
	(0.372)	(2.317)	(0.845)	(0.204)	(0.457)	(0.365)
International Activity * DestP	0.751**	0.0746	-1.371*	2.019***	-0.495	0.444
	(0.351)	(1.392)	(0.682)	(0.574)	(0.583)	(0.575)
Net Intragroup Funding * DestP	0.488	-0.778	30.842***	-5.836	-5.933	-10.537
	(2.179)	(3.608)	(8.008)	(19.266)	(4.690)	(8.388)
Core Deposits Ratio * DestP	-0.169	-0.096	-0.785***	-0.709	0.693	0.267
	(0.314)	(1.210)	(0.283)	(0.491)	(0.711)	(0.228)
Cumulative Effect DestP	-33.637	254.355	-274.016	387.895***	83.985	-11.217
	(93.386)	(524.41)	(272.45)	(134.101)	(149.908)	(111.375)
Observations	2885	2885	2885	2885	2885	2885
Adjusted R-squared	0.023	0.026	0.019	0.022	0.019	0.023
Number of destination countries	35	35	35	35	35	35
Number of banks	6	6	6	6	6	6

Table 5: Outward transmission of policy with alternate dependent variable definitions

This table reports the effects of changes in destination-country regulation on log changes in total loans and log changes in "non-bank private loans" by destination country, while accounting for affiliate vs. cross-border lending. The variable *Affiliate* is set at 1 if more than 95 per cent of the lending of a bank in a given country is done through an affiliate. The definition of *Affiliate* is based on the type of loan being considered in the dependent variable. The number of bank-country-time observations where *Affiliate* = *1* is provided. The data are quarterly from 2000Q1 to 2013Q4 for a panel of bank holding companies. DestP refers to the cumulative changes in regulation in the destination country of the loan. For more details on the variables, see Appendix Table 1. Each column gives the result for the regulatory measure. All specifications include bank characteristics, but those coefficients are not presented for brevity. All specifications also include bank, country and time fixed effects. Standard errors (in parentheses) are clustered by country. ***, ** and * indicate significance at the 1, 5 and 10 per cent level, respectively.

Panel A: Total Lending	DestP – Prudential IndexC	DestP – Capital requirements	DestP – Sector-specific capital buffer	DestP – Loan-to-value ratio	DestP – Reserve requirement foreign	DestP – Reserve requirement local
Destination-country regulation DestP_t	5.545***	11.981**	-2.309	5.300	-2.549	3.350*
	(1.871)	(5.285)	(3.151)	(5.026)	(1.555)	(1.853)
Destination-country regulation DestP_t-1	1.768	5.786	-3.407	-0.930	1.887	1.598
	(1.827)	(5.148)	(2.673)	(2.819)	(3.417)	(3.106)
Destination-country regulation DestP_t-2	1.164	1.519	3.315	6.105**	-1.140	0.480
	(1.911)	(6.062)	(3.052)	(2.687)	(1.939)	(1.253)
Cumulative Effect DestP	8.477***	19.286	-2.401	10.475***	-1.802	5.428
	(2.784)	(11.806)	(3.151)	(2.993)	(4.161)	(3.331)
DestP_t * Affi_t	-3.791*	-4.267	3.014	-5.333	4.382***	-1.873
	(2.141)	(5.660)	(3.536)	(3.618)	(1.097)	(2.077)
DestP_t-1 * Affi_t-1	-1.355	-1.376	5.489*	-0.832	0.621	0.790
	(2.117)	(7.185)	(3.068)	(3.748)	(3.035)	(2.718)
DestP_t-2 * Affi_t-2	-0.308	1.836	-1.319	-4.384	4.171**	1.136
	(2.187)	(5.895)	(4.212)	(3.674)	(1.938)	(1.686)
Cumulative Effect DestP * Affi	-5.454*	-3.806	7.184	-10.551***	9.174***	0.054
	(2.953)	(9.668)	(4.615)	(3.375)	(3.144)	(3.187)
Observations	2885	2885	2885	2885	2885	2885
Observations with Affi = 1	1,721	1,721	1,721	1,721	1,721	1,721
Adjusted R-squared	0.025	0.024	0.021	0.022	0.021	0.022
Panel B: Non-Bank Private Lending	DestP – Prudential IndexC	DestP – Capital requirements	DestP – Sector-specific capital buffer	DestP – Loan-to-value ratio	DestP – Reserve requirement foreign	DestP – Reserve requirement local
Destination-country regulation DestP_t	2.833	11.982**	-0.436	2.956	0.363	-13.368**
	(3.437)	(5.310)	(6.989)	(15.129)	(2.313)	(5.137)
Destination-country regulation DestP_t-1	2.608	8.138	-11.959	-5.739	6.671*	15.030*
	(5.235)	(6.244)	(9.329)	(11.679)	(3.625)	(8.725)
Destination-country regulation DestP_t-2	-6.518	8.855**	11.163	-1.829	-11.761**	-15.778***
	(4.000)	(3.989)	(7.070)	(6.242)	(5.111)	(5.181)
Cumulative Effect DestP	-1.078	28.975***	-1.231	-4.612	-4.727	-14.116***
	(5.714)	(9.371)	(10.934)	(27.861)	(4.034)	(4.568)
DestP_t * Affi_t	-1.627	-11.047	1.697	-6.105	-1.605	14.504**
	(3.893)	(7.077)	(6.664)	(15.796)	(2.283)	(5.471)
DestP_t-1 * Affi_t-1	-3.978	-2.426	12.445	7.066	-8.610	-17.626*
	(5.586)	(9.103)	(10.799)	(12.180)	(5.278)	(8.772)
DestP_t-2 * Affi_t-2	6.367*	-10.771	-13.653*	4.158	13.137***	17.473***
	(3.652)	(7.479)	(6.803)	(6.350)	(3.844)	(5.036)
Cumulative Effect DestP * Affi	0.762	-24.244*	-0.743	5.118	2.921	14.352***
	(5.198)	(13.390)	(2.372)	(28.362)	(5.152)	(4.395)
Observations	2589	2589	2589	2589	2589	2589
Observations with Affi = 1	2,354	2,354	2,354	2,354	2,354	2,354
Adjusted R-squared	0.042	0.043	0.041	0.041	0.041	0.047
Number of destination countries	35	35	35	35	35	35
Number of banks	6	6	6	6	6	6

Table 6: Outward transmission of overall policy to destination country (individual bank characteristics)

This table reports the effects of changes in the overall prudential regulation index ("PruC") and each individual firm characteristic on log changes in total loans by destination country. The data are quarterly from 2000Q1 to 2013Q4 for a panel of bank holding companies and are globally consolidated at the parent level. PruC refers to whether there have been any changes in prudential policy in the destination country of the loan. For more details on the variables, see Appendix Table A1. All specifications include bank, country and time fixed effects. Standard errors (in parentheses) are clustered by country. ***, ** and * indicate significance at the 1, 5 and 10 per cent level, respectively.

	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Overall Prudential Regulation PruC_t	3.779**	3.796**	3.793**	3.785**	3.805**	3.803**
	(1.460)	(1.442)	(1.444)	(1.463)	(1.448)	(1.447)
Overall Prudential Regulation PruC_t-1	1.229	1.253	1.248	1.234	1.295	1.251
	(1.511)	(1.496)	(1.498)	(1.515)	(1.497)	(1.498)
Overall Prudential Regulation PruC_t-2	1.056	1.093	1.083	1.065	1.075	1.077
	(1.341)	(1.342)	(1.351)	(1.344)	(1.354)	(1.353)
Log Total Assets_t-1	-3.329					
	(4.662)					
Tier1 Ratio_t-1		-0.326				
		(0.854)				
Illiquid Assets Ratio_t-1			-0.051			
			(0.154)			
International Activity_t-1				-0.036		
				(0.135)		
Net Intragroup Funding_t-1					0.207*	
					(0.119)	
Core Deposits Ratio_t-1						0.023
						(0.177)
Financial cycle (Destination country)	0.019	0.015	0.016	0.017	0.017	0.017
	(0.033)	(0.035)	(0.034)	(0.034)	(0.034)	(0.034)
Business cycle (Destination country)	0.566*	0.545	0.551*	0.559*	0.557*	0.557*
	(0.322)	(0.323)	(0.319)	(0.319)	(0.322)	(0.321)
Cumulative Effect DestP	6.064**	6.141**	6.124**	6.084**	6.130**	6.132**
	(2.567)	(2.538)	(2.542)	(2.577)	(2.541)	(2.542)
Observations	2285	2285	2285	2285	2285	2285
Adjusted R-squared	0.026	0.026	0.026	0.026	0.026	0.026
Number of destination countries	35	35	35	35	35	35
Number of banks	6	6	6	6	6	6

Table 7: Outward transmission of policy to destination country (alternate lag structure)

This table reports the effects of changes in destination-country regulation and firm characteristics on log changes in total loans by destination country. The data are quarterly from 2000Q1 to 2013Q4 for a panel of bank holding companies and are globally consolidated at the parent level. DestP refers to the changes in regulation in the destination country of the loan. For more details on the variables, see Appendix Table A1. Each column gives the result for the regulatory measure specified in the column headline. All specifications include bank, country and time fixed effects. Standard errors (in parentheses) are clustered by country. ***, ** and * indicate significance at the 1, 5 and 10 per cent level, respectively.

	DestP – Prudential IndexC	DestP – Capital requirements	DestP – Sector-specific capital buffer	DestP – Loan-to-value ratio	DestP – Reserve requirement foreign	DestP – Reserve requirement local
Destination-country regulation DestP_t	3.732**	9.161**	0.022	2.231	-1.274	2.303*
	(1.534)	(4.272)	(1.669)	(3.732)	(0.979)	(1.348)
Destination-country regulation DestP_t-1	0.901	4.655	0.800	-1.391	1.903	1.671
	(1.446)	(3.981)	(1.555)	(1.752)	(2.331)	(2.265)
Destination-country regulation DestP_t-2	1.579	2.338	2.517	3.343**	0.768	1.242
	(1.115)	(4.252)	(2.500)	(1.634)	(1.559)	(1.343)
Log Total Assets_t-3	-6.681	-7.609	-6.882	-6.672	-7.079	-7.169
	(11.412)	(11.367)	(11.392)	(11.625)	(11.404)	(11.401)
Tier1 Ratio_t-3	0.550	0.554	0.574	0.557	0.557	0.497
	(0.884)	(0.836)	(0.842)	(0.854)	(0.845)	(0.845)
Illiquid Assets Ratio_t-3	0.134	0.117	0.104	0.116	0.121	0.136
	(0.291)	(0.283)	(0.286)	(0.285)	(0.282)	(0.289)
International Activity_t-3	0.088	0.071	0.064	0.069	0.063	0.072
	(0.215)	(0.217)	(0.219)	(0.217)	(0.219)	(0.220)
Net Intragroup Funding_t-3	0.275**	0.280**	0.255*	0.256*	0.252*	0.253*
	(0.128)	(0.124)	(0.130)	(0.130)	(0.130)	(0.131)
Core Deposits Ratio_t-3	-0.444	-0.453	-0.442	-0.446	-0.457	-0.451
	(0.448)	(0.450)	(0.451)	(0.450)	(0.451)	(0.450)
Financial cycle (Destination country)	0.018	0.018	0.018	0.016	0.019	0.019
	(0.034)	(0.035)	(0.033)	(0.032)	(0.033)	(0.033)
Business cycle (Destination country)	0.653**	0.809**	0.801**	0.771**	0.802**	0.832**
	(0.309)	(0.305)	(0.313)	(0.317)	(0.323)	(0.310)
Cumulative Effect DestP	6.212**	16.154*	3.340	4.213	1.397	5.216**
	(2.424)	(9.424)	(3.270)	(4.033)	(2.172)	(2.232)
Observations	2745	2745	2745	2745	2745	2745
Adjusted R-squared	0.026	0.025	0.022	0.023	0.022	0.024
Number of destination countries	35	35	35	35	35	35
Number of banks	6	6	6	6	6	6

Table 8: Outward transmission of policy changes in the home country

This table reports the effects of changes in both destination and home-country regulation, along with firm characteristics on log changes in total loans by destination country. The data are quarterly from 2000Q1 to 2013Q4 for a panel of bank holding companies and are globally consolidated at the parent level. DestP refers to the changes in regulation in the destination country of the loan, while HomeP capture changes in Canadian regulations. For more details on the variables, see Appendix Table A1. Each column gives the result for the regulatory measure specified in the column headline. All specifications include bank, country and time fixed effects. Standard errors (in parentheses) are clustered by country ***, ** and * indicate significance at the 1, 5 and 10 per cent level, respectively.

	Home DestP – Prudential Index	Home DestP – Capital requirements	Home DestP – Loan-to-value ratio
Destination-country regulation DestP_t	3.629**	9.884**	1.933
	(1.467)	(4.224)	(3.581)
Destination-country regulation DestP_t-1	1.214	4.997	-1.378
	(1.489)	(3.792)	(1.659)
Destination-country regulation DestP_t-2	0.957	2.413	3.634**
	(1.335)	(4.522)	(1.608)
Log Total Assets_t-1	-11.990	-13.492*	-11.808*
	(7.570)	(7.464)	(6.319)
Tier1 Ratio_t-1	-0.917	-0.775	-0.970
	(1.024)	(1.033)	(1.120)
Illiquid Assets Ratio_t-1	-0.301	-0.362	-0.159
	(0.302)	(0.340)	(0.232)
International Activity_t-1	0.266	0.199	0.129
	(0.214)	(0.191)	(0.181)
Net Intragroup Funding_t-1	0.144	0.226	0.154
	(0.108)	(0.157)	(0.115)
Core Deposits Ratio_t-1	0.350	0.252	0.179
	(0.356)	(0.389)	(0.332)
Financial cycle (Destination country)	0.016	0.021	0.014
	(0.034)	(0.034)	(0.031)
Business cycle (Destination country)	0.572*	0.698**	0.669**
	(0.329)	(0.315)	(0.327)
Log Total Assets * HomeP	23.666**	28.817	31.276**
	(10.740)	(20.182)	(14.161)
Tier1 Ratio * HomeP	-0.279	-16.616	2.289
	(4.272)	(14.137)	(3.597)
Illiquid Assets Ratio * HomeP	-0.682	-2.786*	-0.803
	(0.771)	(1.591)	(0.842)
International Activity * HomeP	-1.044	-3.312**	-0.883
	(0.679)	(1.477)	(0.659)
Net Intragroup Funding * HomeP	0.265	-0.493	0.171
	(0.527)	(1.722)	(0.724)
Core Deposits Ratio * HomeP	-0.042	1.743*	-0.149
	(0.462)	(0.933)	(0.424)
Cumulative Effect DestP	5.801**	17.294*	4.188
	(2.701)	(9.458)	(4.219)
Observations	2885	2885	2885
Adjusted R-squared	0.027	0.028	0.021
Number of destination countries	35	35	35
Number of banks	6	6	6

Table 9: Inward transmission of foreign policy (bank character interactions)

This table reports the effects of changes in regulation and firm characteristics and their interactions on log changes in total loans. The data are quarterly from 2000Q1 to 2013Q4 for a panel of domestic bank holding companies. Foreign exposure weighted regulation ExpP is calculated as the weighted average of changes in foreign regulation where the weights are total assets and liabilities of the bank in the respective foreign country. For ExpP and its interaction effects, the reported coefficient is the sum of the contemporaneous term and two lags. For more details on the variables, see Appendix Table 1. Each column gives the result for the regulatory measure specified in the column headline. All specifications include fixed effects as specified in the lower part of the table. Standard errors (in parentheses) are clustered by bank ***, ** and * indicate significance at the 1, 5 and 10 per cent level, respectively.

	DestP = Prudential IndexC	DestP = Capital requirements	DestP = Sector-specific capital buffer	DestP = Loan-to-value ratio	DestP = Reserve requirement foreign	DestP = Reserve requirement local
Foreign exposure weighted regulation ExpP_t	-438.244**	-1217.757	-1696.535	-6871.63***	-1047.911	-275.274
	(131.102)	(776.570)	(4652.770)	(1524.869)	(5981.322)	(866.707)
Foreign exposure weighted regulation ExpP_t-1	-170.373*	-49.580	-1077.606	-5067.450*	-203.457	-263.241
	(77.613)	(1130.472)	(3027.083)	(2269.151)	(1419.050)	(198.326)
Foreign exposure weighted regulation ExpP_t-2	116.826	-2978.729***	1401.927	1595.700	2273.573	-1218.179
	(184.187)	(179.761)	(2012.377)	(1611.216)	(3108.629)	(734.963)
Log Total Assets_t-1	-4.051	-5.280	-3.632	-7.219*	-5.407	-2.399
	(3.238)	(4.387)	(4.401)	(3.474)	(3.363)	(2.896)
Tier1 Ratio_t-1	-0.240	-0.363	-0.175	-0.028	-0.185	-0.254
	(0.385)	(0.446)	(0.457)	(0.393)	(0.491)	(0.535)
Illiquid Assets Ratio_t-1	-0.556**	-0.532**	-0.484**	-0.484**	-0.521*	-0.502**
	(0.205)	(0.175)	(0.171)	(0.155)	(0.216)	(0.183)
International Activity_t-1	0.088	0.092	0.057	0.077	0.085	0.044
	(0.123)	(0.099)	(0.106)	(0.112)	(0.103)	(0.101)
Net Intragroup Funding_t-1	-0.078	-0.048	-0.153	-0.285	-0.146	-0.098
	(0.275)	(0.282)	(0.302)	(0.308)	(0.254)	(0.264)
Core Deposits Ratio_t-1	0.540**	0.522**	0.458**	0.429*	0.492*	0.499**
	(0.195)	(0.166)	(0.143)	(0.186)	(0.212)	(0.167)
Log Total Assets * ExpP	30.096	196.318***	9.001	527.843**	-28.539	95.766
	(11.883)	(9.150)	(88.683)	(77.254)	(175.089)	(39.458)
Tier1 Ratio * ExpP	-2.929	-5.007	41.882	-13.531	-16.127	-11.339
	(4.434)	(33.071)	(192.365)	(79.335)	(362.828)	(13.519)
Illiquid Assets Ratio * ExpP	-0.820	5.567**	8.886	-5.416	11.471	-2.613
	(0.888)	(1.096)	(14.962)	(6.394)	(29.195)	(5.172)
International Activity *ExpP	-1.215	1.613	1.793	-0.878	-24.269**	0.016
	(1.485)	(1.774)	(6.111)	(3.735)	(6.215)	(2.246)
Net Intragroup Funding * DExpP	-6.259	-148.947***	22.144	-181.251*	134.573	-40.295
	(13.704)	(33.444)	(362.071)	(145.678)	(568.325)	(45.864)
Core Deposits Ratio * ExpP	-0.310	-1.627*	7.536	9.489	-13.152	5.064
	(4.426)	(7.658)	(35.941)	(20.752)	(14.708)	(9.737)
Cumulative Effect ExpP	-491.791*	-4246.067***	-1372.215	-10343.37**	1022.205	-1756.693
	(233.702)	(420.510)	(5063.908)	(3511.574)	(4261.746)	(1328.221)
Observations	324	324	324	324	324	324
Adjusted R-squared	0.199	0.192	0.194	0.222	0.189	0.215
Number of banks	6	6	6	6	6	6

Appendix

Table A1: Construction of balance-sheet independent variables

Variable name	Report form description	Source
Illiquid Assets Ratio$_{b,t-1}$	[All loans net of allowance for impairment/Total assets]*100	Balance Sheet (M4)
LogRealAssets$_{b,t-1}$	Ln[Total assets in 2012 Canadian Dollars]	Balance Sheet (M4). CPI is from the Bank of Canada
Core Deposits Ratio$_{b,t-1}$	[Demand, notice and time deposits by individuals/Total assets]*100	Balance Sheet (M4)
Tier1Ratio$_{b,t-1}$	[Tier 1 risk-based capital/Risk-weighted assets]*100	Basel Capital Adequacy Return (BCAR-BA)
Net Due To$_{b,t-1}$	[(Total head office claims on foreign branches, agencies and consolidated subsidiaries – Total head office liabilities to foreign branches, agencies and consolidated subsidiaries)/Total liabilities]*100	Geographic Assets and Liabilities Booked in Canada (GQ). Total liabilities from Balance Sheet (M4)
InternationalRatio$_{b,t-1}$	[(Total foreign assets + Total foreign liabilities)/(Total assets + Total liabilities)]*100	Geographic Assets and Liabilities Booked in Canada (GQ). Total assets and total liabilities from Balance Sheet (M4)

Table A2: Loan-to-value changes in Canada over the sample period

Period	Direction	Details
2006Q4	Loosening	From 95% to 100% on all homebuyers
2007Q1	Loosening	From 90% to 95% on refinancing activities
2008Q4	Tightening	From 100% to 95% on all homebuyers
2010Q2	Tightening	From 95% to 80% on investment properties; from 95% to 90% on refinancing activities
2011Q1	Tightening	From 95% to 85% on refinancing activities
2012Q3	Tightening	From 85% to 80% on refinancing activities

Table A3: Foreign countries included in the sample

Country	No. of active Canadian Banks
Argentina	2
Australia	5
Austria	2
Belgium	1
Brazil	3
Chile	4
China	6
Denmark	1
Finland	1
France	5
Germany	4
Greece	1
Hong Kong	3
India	2
Indonesia	2
Ireland	4
Japan	4
Luxembourg	4
Malaysia	1
Mexico	4
Netherlands	5
NewZealand	1
Norway	3
Peru	1
Russian Federation	2
Singapore	2
Slovak Republic	1
South Korea	3
Spain	2
Sweden	3
Switzerland	4
Thailand	1
Turkey	2
United Kingdom	6
United States	6

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